

ectoderm lying in the median longitudinal axis, from which, according to Sarasin, the pedal, intestinal, and visceral ganglia proceed, and which he homologizes with the ventral nerve-cord of the Annelids.

In opposition to Sarasin I must lay stress upon the following points. There is in *Bythinia* a separate mesoderm, which arises from the endoderm, and the development of which from the two primitive cells is traceable step by step. The archenteron proceeds from an invagination of the endoderm. The whole mid-gut, *i. e.* stomach and liver, as well as end-gut (if we can use the term at all as applied to mollusks), arises from the archenteron, which always exhibits a distinct lumen. The mouth proceeds directly from the blastopore, accompanied by an invagination of the ectoderm, which forms the œsophagus; consequently a complete closure of the blastopore does not take place. The anal opening corresponds to a small pit at the hinder end of the blastoporal groove. Primitive kidney and kidney, apart from their ectodermic excretory ducts, are of mesodermic origin; the same is true for the heart and pericardium. The ganglia arise completely separate from one another, and do not come into connexion until afterwards.—*Zoologischer Anzeiger*, xiv. Jahrg., 1891, no. 376, pp. 385-388.

On certain Reproductive Phenomena in Cirrhipedes.

By M. A. GRUVEL.

The history of the preliminary phenomena of fertilization in the Cirrhipedes is little known. Darwin, relying on the anatomical characters (length of the penis) and on the observation that the ova are not ripe at the same time as the spermatozoa, concluded that reciprocal fertilization must take place, but never actually witnessed it. I was fortunate enough, during my stay at the seaside*, to make a few interesting observations on this subject.

I had in a tank of the aquarium several specimens of *Balanus* (*B. tintinnabulum*) which had been living for some time and were adult; my attention was attracted by the very peculiar movements of one of them.

The movements of the cirri were accelerated, then all at once the latter stopped, opened behind, and from the midst of them there arose a sort of very mobile tentacle, which was moved to the right, to the left, backwards, and in every direction, as if seeking for something: this was the penis. Soon a contraction set in and emission took place; the penis then resumed its position between the cirri, which also resumed their ordinary movements, until the occurrence of a fresh series of similar phenomena.

My attention once directed to this point, I was not long in discovering analogous phenomena in *Lepas anatifera*.

Individuals of the latter species embrace one another to a certain extent with their cirri. It frequently happens that the fertilized

* These investigations were carried out at M. de Lacaze-Duthiers' laboratory of experimental zoology at Roscoff during the months of August and September, 1891.

animal seizes the penis of the male between its cirri and drags it inside its valves, where it retains it, unless the latter, as is often the case, penetrates thither by itself. The animals remain in this way, pressed one against the other, producing little movements of contraction. Emission takes place, and the sperm is always deposited, in the form of a gelatinous mass, beneath the ovigerous frenum on each side of the body. On each occasion that I noticed it it was the smaller animal of the two that played the part of the male.

If there are several specimens of *Lepas* or *Balanus* whose spermatozoa are ripe surrounding another individual which is ready to be fertilized, it is not unusual to see several of them participating in the fertilization of the same individual.

Another phenomenon is frequently witnessed which is strange enough to be worthy of mention. Two *Balani* (*B. tintinnabulum*) are attached to the same fragment of rock, both of small size, and both with the cirri extended in the same direction. The hindermost one wishes to fertilize its neighbour: it tries, but its penis is too short and cannot reach as far as the orifice of the chamber in order to deposit its sperm there. Then, by a simple process which might be termed ingenious, it turns abruptly in its chamber about three quarters round, and thus diminishing the space which separates them by the length of the orifice of the chamber, it is able to succeed in fertilizing its neighbour.

From these facts, and others which cannot find a place in this note, we must conclude that the ordinary mode of fertilization in the Cirrhipedes is reciprocal. When this method is rendered impossible, by various circumstances, more especially by the fixation of the animals, self-fertilization may also take place.

There is no actual copulation, but merely approximation of the sexes and deposition of fertilizing matter in the neighbourhood of the oviferous females.

It was impossible to determine the existence of reciprocal fertilization in *Pollicipes*; I am inclined to believe that in this case there is only simple self-fertilization.—*Comptes Rendus*, t. cxiii. no. 20 (Nov. 16, 1891), pp. 706-708.

On the Embryogeny of Sagitta. By M. S. JOURDAIN.

Observations made on the development of *Sagitta* have led me to differ from Kowalewsky and Bütschli in my conception of the formation of the archenteric cavity, which appears in these animals at the *gastrula* stage. According to the naturalists mentioned, this cavity, which is simple at first, should divide at its anterior region into three lobes, while preserving its simplicity in its posterior portion. The lateral lobes of the tripartite region would constitute the general body-cavity: the median lobe would form the digestive canal of the perfect animal. This view appears to me to be erroneous.

The archenteric cavity, open behind at the blastopore, which occupies the region of the future anus, gives rise not to the general